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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

CEREAL PACKER (cereal) 920.887

S-127

TM 001 560

U. S. Employment Service in
Cooperation with
California State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
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Spring 1957

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR CEREAL PACKER (cereal) 920.887-064

S-127

Summary

The General Aptitude Test Battery, B-1002A, was administered during the period May 20 to May 28, 1957, to 54 women employed as Cereal Packer 920.887 by the W. K. Kellogg Company, San Leandro, California. The criterion consisted of supervisory rank order ratings, converted to linear scores. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes K-Motor Coordination and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Cereal Packer (cereal) 920.887 S-127

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Cereal Packer 920.887.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for S-127

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
T	CB-1-G CB-1-K	90	K	Part 8	95
M	CB-1-M CB-1-N	105	M	Part 9 Part 10	100

Effectiveness of Norms

The data in Table IV indicate that 10 of the 18 poor workers, or 56 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 56 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 27 of the 35 workers who made qualifying test scores, or 77 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Cereal Packer (cereal) 920.887.

II. Sample

The GATB, B-1002A, was administered during the period May 20 to May 28, 1957, to 62 women employed on three shifts as Cereal Packers 920.887 at W. K. Kellogg Company, San Leandro, California. Workers were selected by the personnel office to exclude those with less than one month of employment, so that the sample would include only experienced workers. The individuals selected were asked by the foremen or foreladies to take the test on a voluntary basis, on paid overtime. Those who did not wish to take the test were excused. Eight of the women tested were excluded from the sample; five because they did not have recent experience as Packers at this plant and were presently on other jobs; one because she had less than a sixth grade education; and two because of poor eyesight and a temporary hand impairment. This resulted in a final sample of 54 women.

According to the foreladies' estimates, the training period is four hours for each station. The stations vary only according to the size and weight of the cartons to be packed. A period of one week is required to train women to pack at all stations.

There are no experience or education requirements. The company prefers applicants between the ages of 20 and 35 years, 5'3" or taller. They must be able to work on any of three shifts and furnish their own transportation. Applicants must pass a routine pre-employment physical examination.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

Cereal Packer (cereal) 920.887
N = 54

	M	σ	Range	r
Age (years)	32.8	4.7	22-42	-.020
Education (years)	10.1	1.7	6-12	-.035
Experience (months)	23.6	15.3	1-58	.268*

* Significant at the .05 level

There are no significant correlations between age or education and the criterion. The significant correlation between experience and the criterion, which is not high in magnitude, may indicate a slight bias on the part of the supervisors in favor of those workers with the most experience, or it may reflect a true relationship between job proficiency and length of experience. The data indicate that the sample is suitable for test development purposes with respect to age, education, and experience.

III. Job Description

Job Title: Cereal Packer (cereal) 920.887-064

Job Summary: Packs cartons of corn flakes, bran, rice, or other breakfast food in cardboard cases for sealing and shipment. Carries a stack of flat-folded cardboard cases to a table from the supply of cases which is near the packing station. Lifts a case and opens it by pressing the opposite corners together with both hands. Slides the case into a frame of steel rods to hold the case for packing. Reaches up to a moving conveyor belt, takes a row of specified number of cartons, pressing end cartons firmly to hold row intact, and drops row of cartons into case. Shoves full case of cartons from frame of steel rods onto rollers of stationary conveyor. When packing larger cartons in layers, turns wrists to invert second layer, dropping rows of cartons into case top-down. Alternates with another Packer on larger cartons, opening cases or packing, to relieve wrist fatigue.

IV. All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consists of rank order ratings made by three foreladies for workers on three different shifts as follows:

(1) Nineteen workers were rated by the First Shift Forelady.
(2) Twenty workers were rated by the Second Shift Forelady.
(3) Fifteen workers were rated by the Third Shift Forelady.

The ratings for the three shifts were combined by converting the ranks for each shift into linear scores and then forming one distribution for the total sample by ranking all the workers on the basis of the linear scores. Tie ranks were broken by computing the percent position, using the formula:

$$\text{Percent position} = \frac{100(R - .5)}{N}$$

(formula for converting ranks into percents of the normal curve). In each instance, the individual with the smaller (closer to zero) percent position was assigned the higher (closer to one) rank. This distribution for the total sample which ranged from 1 to 54, was converted to linear scores and used as the validation criterion.

VI. Statistical and Qualitative Analysis

A. Statistical Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Cereal Packer (cereal) 920.887
N = 54

Aptitudes	M	σ	r
G-Intelligence	90.9	14.9	-.014
V-Verbal Aptitude	92.5	12.6	-.023
N-Numerical Aptitude	89.4	16.0	.003
S-Spatial Aptitude	91.4	17.7	.016
P-Form Perception	99.1	17.8	-.041
Q-Clerical Perception	99.7	15.0	.050
K-Motor Coordination	102.3	12.2	.221
F-Finger Dexterity	105.0	16.2	.042
M-Manual Dexterity	110.4	14.0	.291*

* Significant at the .05 level

The highest mean scores in decreasing order of magnitude were obtained for Aptitudes M, F, K, and Q, respectively. Aptitude K exhibits the smallest standard deviation. When N = 54, correlations of .348 and .268 are significant at the .01 level and the .05 level, respectively. Aptitude M correlates significantly with the criterion at the .05 level of confidence.

B. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Motor Coordination (K) - required to use both hands to take cartons from moving conveyor, to press row of cartons together, and to drop row into tight-fitting case. Also required to use hands alternately to lift flat-folded case and to push full case onto stationary conveyor.

Manual Dexterity (M) - required to use both hands to take row of cartons from moving conveyor, to drop row in case, and to turn wrists to invert rows.

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Manual Dexterity (M) - required to use both hands to take row of cartons from moving conveyor, to drop row in case, and to turn wrists to invert rows.

C. Selection of Test Norms:

On the basis of the quantitative and qualitative evidence cited above, Aptitudes K, F, and M were considered further for inclusion in the test norms. Aptitudes K and M appeared to be important on the basis of the job analysis data and both have high mean scores. In addition, Aptitude M correlates significantly with the criterion at the .05 level. Aptitude F has the second highest mean score for the sample. Although Aptitude Q shows a relatively high mean score, it was not given further consideration for inclusion in the test norms because there was no other qualitative or quantitative evidence of significance.

Various combinations of Aptitudes K, F, and M with appropriate cutting scores were selected as trial norms. The best selective efficiency was obtained for norms which consisted of K-85 and M-105. However, it is believed that setting the cutting score at 105 on Aptitude M would tend to fail too high a proportion of local office applicants when the test norms are used on a national basis and good selective efficiency was obtained for norms consisting of K-95 and M-100.

In test development studies, an attempt is made to develop a set of norms such that the cutting score for each aptitude will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In the case of this study, the aptitude cutting scores are each within five points of one standard deviation below the aptitude mean of the experimental sample.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized by placing one-third of the sample in the low criterion group. A criterion critical score of 42 was used to form the dichotomy between good and poor workers. This resulted in 18 of the 54 workers, or 33 percent of the sample, being placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes K and M with critical scores of 95 and 100, respectively, and the dichotomized criterion for Cereal Packer 920.887 Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes K and M with Critical Scores of 95 and 100, Respectively, and the Criterion for Cereal Packer (cereal) 920.887

N = 54

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	27	36
Poor Workers	10	8	18
Total	19	35	54

$r_{tet} = .48$ $\quad X^2 = 3.664$

$\sigma_{r_{tet}} = .23$ $\quad P/2 < .05$

The data in the above table indicate a significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes K and M with minimum scores of 95 and 100, respectively, are recommended as B-1002 norms for the occupation of Cereal Packer 920.887. The equivalent B-1001 norms consist of T-90 and M-105.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include two aptitudes, only those occupational aptitude patterns which include these two aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. None of the existing 23 occupational aptitude patterns meet these requirements for this study. Therefore, none of the existing occupational aptitudes is recommended for the occupation covered by this study. However, the data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.